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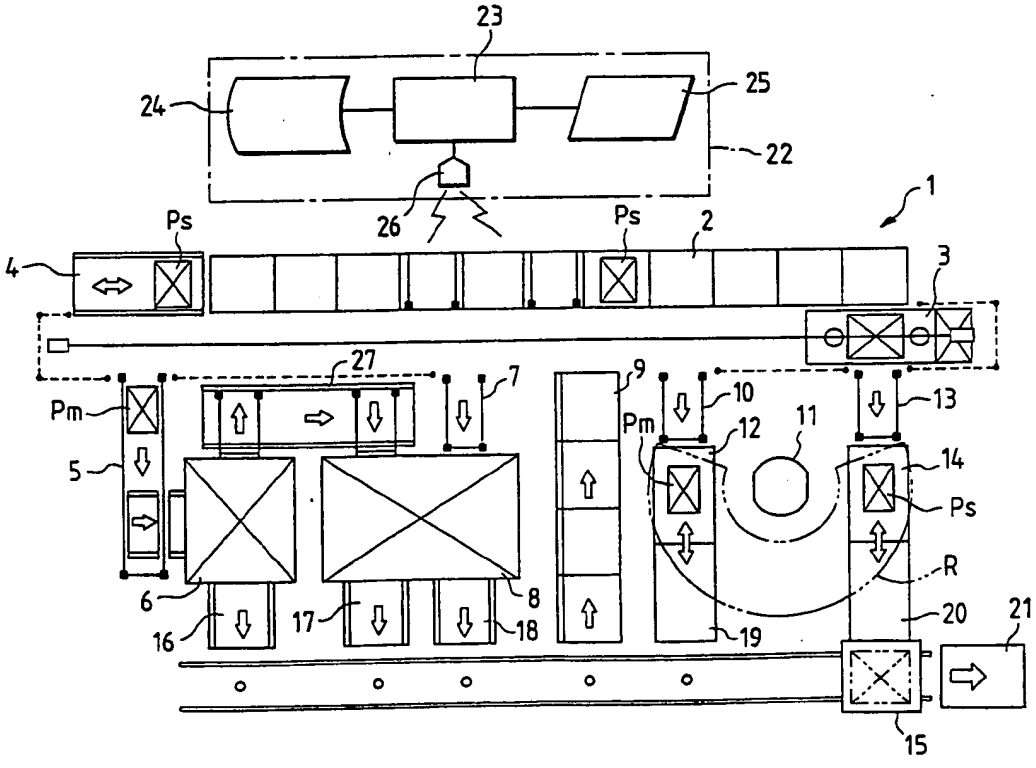
(54) Stock handling system

(57) A central processing device (23) stores data on articles to be handled and determines a stacking plan corresponding to a delivery request from an input device (25) based on the data and provides commands to respective handling devices by way of a communication device (26). One-type-article pallets (Ps) are taken out from a row of shelves (2) by means of a crane (3) and are transferred to a layer picker (8) and unitary layers of articles are stacked on a delivery pallet (Pm) in a short period. If the load requested includes an odd lot of articles, then one-type-article pallets are transferred to a depalletizing station (12) of a depalletizing robot (11) and the odd lots are automatically loaded on the delivery pallets at a palletizing station (14) before the delivery pallets are transferred to a delivery station (21).



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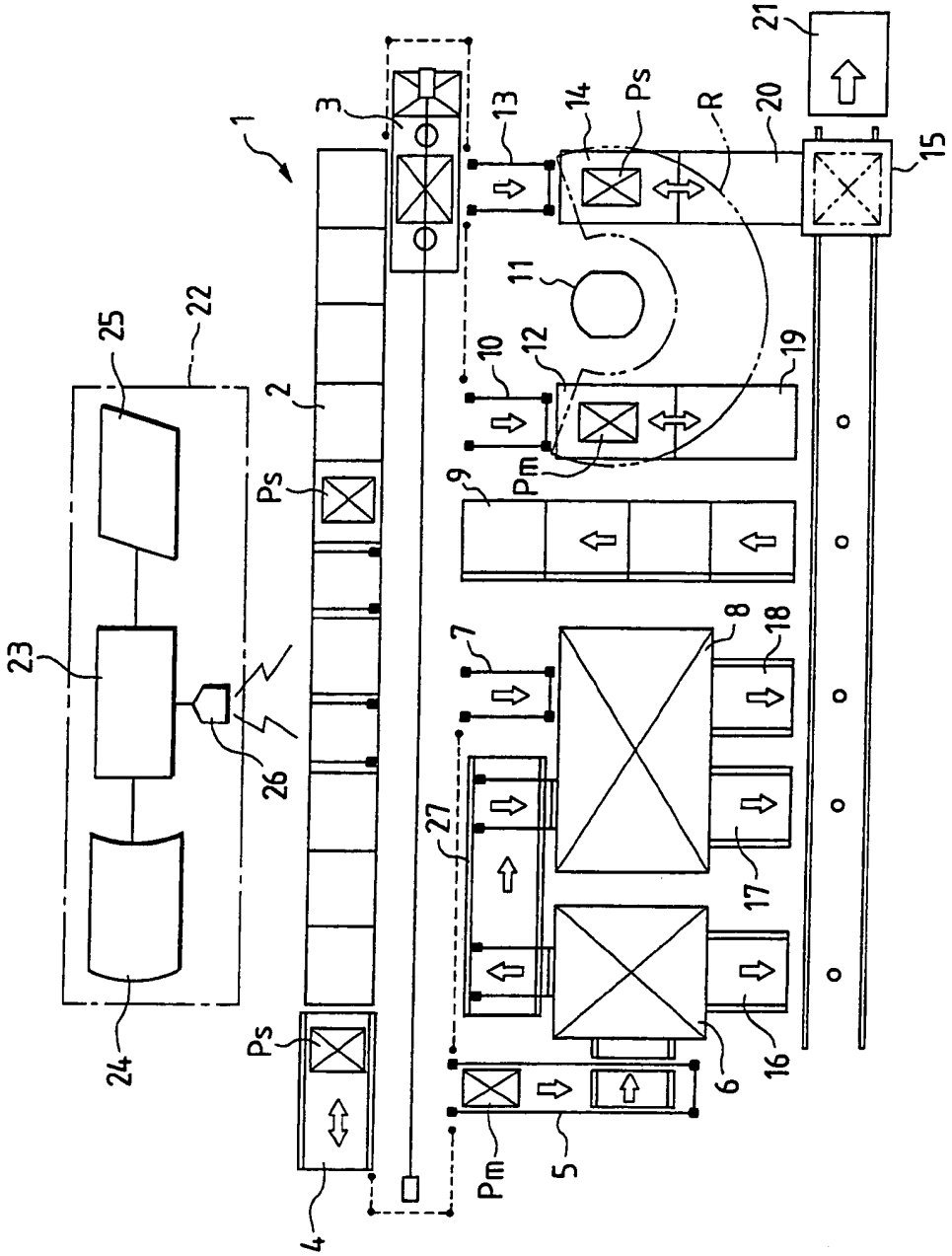
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Stock Handling System

This invention relates to a stock handling system capable of stacking articles as requested on pallets in accordance with delivery demands, e.g. customer requests.

In D-I-Y centres and large stores and the like, stock handling systems are used in which the picking of articles from store is carried out, in terms of the kind and number of articles, based upon the demands of the customers. The handling system comprises an automated warehouse which temporarily stores one-type-article pallets on which a single kind of article is loaded on the pallets, and a layer picker which transfers a desired kind and number of articles from the one-type-article pallets in layers to delivery pallets or palletizing robots.

Although the layer picker can stack the articles loaded on the one-type-article pallets onto the delivery pallets in layers, the picker cannot distribute odd numbers of articles. Therefore, workers must handle these odd lots manually to complement the layer stacking operation. Although a palletizing robot can distribute fractions of a layer at a desired position, the palletizing robot can only carry one article at a time so that it takes a considerable time to palletize a layer which is made up of a large number of articles.

Accordingly, it is an object of the present invention to provide a stock handling system which can automatically stack the articles on the delivery pallets in a short time.

In accordance with the invention there is provided a stock handling system comprising a central processing device which stores data relating to a plurality of kinds of articles and is capable of

providing a stacking plan corresponding to a delivery order and based on said data, layer picker means arranged to carry out a stacking of said articles in unitary layers upon receiving stacking-plan commands from said central processing device, and robot means arranged to stack odd numbers of said articles upon receiving stacking-plan commands.

With the above-mentioned construction, this invention provides the following manner of operation.

In the system according to this invention, the central processing device memorises data on a plurality of kinds of article, such as size, weight patterns of each layer depending on the size, or restrictions such as height or manner of stacking. Upon receiving a delivery request, the central processing device makes a stacking plan based on the data and transmits commands to the layer picker means and to the robot means. The layer picker means performs a stacking operation upon receiving commands as to the stacking layout, while the robot means performs the loading of odd lots upon receiving appropriate commands.

In order that the invention may be fully understood, a preferred embodiment of stock handling system in accordance with the invention will now be described by way of example and with reference to the accompanying drawing which is a schematic plan view of the stock handling system.

The system of the present invention can handle a plurality of different kinds of article which are packaged in any one of three kinds of packaging forms, namely a carton case, a plastic box and a shrink packaging.

In the drawing, in an automated warehouse 1 a plurality of articles (whether of the same kind or

different kinds) are stored on one-type-article pallets Ps on a plurality of rows of shelves 2. Along the front of the row of shelves, a crane 3 travels back and forth on a linear path. The path runs alongside the front ends of the openings of the row of shelves 2. The crane 3 travels along the travel path and is raised and lowered so as to carry out the depositing and removal of the one-type-article pallets Ps. Adjacent to one end of the row of shelves 2 a deposit/removal station 4 is provided.

At the side of the travel path of the crane 3 which is opposite to the shelves, a plurality of stations are provided and at these stations the pallets are transferred between the crane 3 and the stations. A conveyor 5 for empty pallets receives empty delivery pallets Pm by means of the crane 3 and feeds these pallets to an empty-pallet store 6. A one-type-article pallet conveyor 7 receives one-type-article pallets Ps from the crane 3 and supplies them to a layer picker 8.

Empty delivery pallets Pm are supplied to the layer picker 8 from the empty-pallet store 6 by way of an empty-pallet line 27. The layer picker 8 is capable of stacking articles supplied from the one-type-article pallet conveyor 7 on to the empty delivery pallets in the form of a tier of articles. The empty-pallet line 27 also delivers one-type-article pallets Ps which have been completely unloaded to the crane 3.

A depalletizing conveyor 10 provides one-type-article pallets Ps to a depalletizing station 12 of a robot 11, while a palletizing conveyor 13 provides one-type-article pallets Ps to a palletizing station 14 of the robot. The robot 11 has an operational range R within which the depalletizing station 12 and the palletizing station 14 are both positioned.

On the side of the layer picker and robot remote from the row of the shelves 2, a transport car 15 is provided for travel on a linear path. The pallets are transported along the path after having been loaded on the transport car 15. Stations (indicated by small circles) are disposed along the path of travel of the transport car 15. From the empty-pallet store 6, the empty delivery pallets Pm are transferred to the transport car 15 by way of an empty-pallet conveyor 16. From the layer picker 8, the delivery pallets Pm on which layers of articles have been stacked already on the one hand and depleted one-type-article pallets Ps on the other hand are transferred to the transport car 15 by way of a delivery pallet conveyor 17 and a one-type-article pallet conveyor 18 respectively. The transport car 15 delivers the one-type-article pallets Ps to a pallet return line 9. Furthermore, the transfer of articles between the depalletizing station 12 and the palletizing station 14 is carried out utilising conveyors 19 and 20.

At one end of the path of travel of the transport car 15 there is a delivery station 21 which accumulates the delivery pallets Pm on which the palletizing of the articles has been completed.

A central processing device 22 controls the automated warehouse 1, the layer picker 8, the robot 11 and other goods handling devices. The central processing device 22 comprises a CPU 23, a memory 24, an input device 25 and a communication device 26.

The memory 24 stores data on the articles which the stock handling system handles. For example, the memory 24 stores data on articles such as size, dimensions, type of packing, i.e. plastic boxes, carton cases or shrink packaging, the stacking patterns of

respective tiers which vary corresponding to the size of the articles, the loading patterns of odd numbers of articles, and restrictions on the height or manner of stacking such as the prevention of the stacking of a plastic box on shrink-packaged articles.

The input device 25 receives a delivery order. For example, the input device 25 may be an OCR (optical character reader) which reads an order slip and prepares the data therefrom.

Upon receiving the delivery order, the central processing device reads out the data on the articles and determines the mixed stacking plan based on the data. The determined data is transmitted to respective devices through the (radio) communication device 26 for them to carry out the picking operations.

CPU 23 provides both slip resolution processing and stacking processing. In the slip resolution processing, the number of required delivery pallets Pm is computed in the light of the contents of the delivery order on the slip such as the kinds of articles and the number of different kinds of articles, while in the stacking processing the stacking position of the articles is determined.

Following the above-mentioned slip processing and the stacking processing, the central processing device 22 provides stacking plan commands to respective handling devices and the devices stack articles accordingly. The manner of stacking is now explained in the light of the route shown in the drawing.

1. <u>Delivery of one-type-article pallets Ps directly:</u>

In this case, the crane 3 takes out the requested one-type-article pallets Ps from the row of shelves 2 and transfers them to the palletizing conveyor 13. These pallets Ps are then transferred

directly to the delivery station 21 by way of the palletizing station 14, a conveyor 20 and the transport car 15.

2. Stacking on delivery pallets Pm in unitary layers only:

The crane 3 takes out the requested one-type-article pallets Pm from the rows of shelves 2 and loads them on to the one-type-article pallet conveyor 7. The one-type-article pallets Ps are set down at a depalletizing zone in the layer picker 8. Empty delivery pallets Pm are delivered to a palletizing zone in the layer picker 8 from the empty-pallet store 6 by way of the conveyor 27. If the requested articles are of more than one kind, the one-style-article pallets Ps which are needed to fulfil the order are provided in succession by the crane 3. Upon completion of the stacking of the articles on the delivery pallet Pm in unitary layers, the delivery pallets Pm are loaded on to the transport car 15 by way of the delivery pallet conveyor 17 and are carried to the delivery station 21. The depleted one-type-article pallets Ps are retrieved and returned to store by way of the one-type-article pallet conveyor 18, the transport car 15 and the pallet return line 9.

3. Stacking in unitary layers together with odd numbers of articles:

The delivery pallets Pm on which articles have been stacked with unitary layers of articles in the manner described in the above step 2 are then transferred to and set down at the palletizing station 14 by way of the transport car 15 and the conveyor 20. One-type-article pallets Ps are loaded from conveyor 18 on to the transport car 15 and are set down at the depalletizing station 12 by means of the conveyor 19, or else are conveyed thereto by conveyor 10. The

palletizing robot 11 performs a predetermined picking action transferring the appropriate numbers of articles from station 12 to station 14. The delivery pallets Pm are then transferred to the delivery station 21 and the one-type-article pallets Ps are returned to the shelves where they were stored originally.

In this manner, according to this embodiment of picking system, the layer picker 8 provides for the stacking of articles in layers and the palletizing robot 11 provides for the loading of odd numbers of articles, i.e. incomplete layers. Therefore, the manual stacking of odd numbers of articles which would be necessary in a stacking operation using a layer picker only is no longer necessary. Moreover, in contrast to the considerable time which it would take to stack unitary layers by the use of the palletizing robot 11 only, the stacking in accordance with the invention can be carried out in a short time, thus achieving an efficient handling operation.

Although this invention is described with regard to the illustrated embodiment, it is to be understood that the invention can be modified without departing from the scope of the invention.

For example, although in the embodiment shown in the drawing the articles are packaged in a carton case, a plastic case or a shrink packaging, the articles may be packaged in other forms. Furthermore, in the illustrated embodiment, although only one layer picker 8 and one palletizing robot 11 are shown, one could have plural sets of these to meet the working conditions. Also, the layout of these devices is not limited to the one shown in the drawing.

Furthermore, CPU 23 controls the handling system based on the data about the same kind of articles stored in the memory 24 in such a manner that

the one-type-article pallets Ps are transferred between the layer picker 8 and the depalletizing station 12 and the same lots or lots which come before or after are stacked on the same pallets. With this control, it may be possible to compare the total time which is made up of the processing time of the layer picker 8, the processing time of the palletizing robot 11 and the transfer time of the one-type-article pallets Ps for the lot order adjustment, with the processing time necessary for a picking operation using the palletizing robot only and to judge which method is more efficient.

As has been described above, according to the handling system of this invention, the central processing device stores data on a plurality of different kinds of articles and is capable of providing a stacking plan corresponding to a delivery order and based on stored data. The layer picker stacks each layer in a short time upon receiving stacking-plan commands, while the palletizing robot automatically stacks fractions of a layer or odd articles upon receiving the appropriate commands. Therefore, the handling system can save manpower and efficiently carry out the stock transfer operation in a short time.

CLAIMS:

1. A stock handling system comprising a central processing device which stores data relating to a plurality of kinds of articles and is capable of providing a stacking plan corresponding to a delivery order and based on said data, layer picker means arranged to carry out a stacking of said articles in unitary layers upon receiving stacking-plan commands from said central processing device, and robot means arranged to stack odd numbers of said articles upon receiving stacking-plan commands.

2. A system according to claim 1, in which the robot means has access both to one-type-article pallets at a depalletizing station and to partly loaded delivery pallets at a palletizing station.

3. A system according to claim 1 or 2, in which the layer picker means has a first zone supplied with one-type-article pallets and a second zone supplied with empty pallets, and is arranged to transfer layers of articles from the former to the latter.

4. A system according to claim 1, 2 or 3, in which the layer picker means and the robot means are positioned between the path of a crane which is arranged to take palletized articles from storage means and the path of a transport carriage which is arranged to transport loaded pallets to a delivery station.

5. A stock handling system substantially as hereinbefore described with reference to the accompanying drawing.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

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Relevant Technical fields

(i) UK Cl (Edition L) B8W (WC)

(ii) Int Cl (Edition 5) B65G

Search Examiner

M J DAVEY

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

30 APRIL 1993

Documents considered relevant following a search in respect of claims 1 TO 5

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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